

REMARKS

Claims 1, and 3-18 were presented for examination and were rejected in an Office action dated 3/16/2010. The applicants respectfully request reconsideration in light of the amendments and the following remarks.

All claims stand currently amended.

35 U.S.C. § 101 Rejection of Claims 1, 4-6, 10-14, and 18

Claims 1, 4-6, 10-14, and 18 were rejected as being addressed to non-statutory subject matter. (Office action, page 3 (citing *In re Bilski*)). The applicants respectfully submit that the amended claims overcome this rejection.

Several claims have been amended to recite actions "by a processor-based device" or "by the processor-based device." The processor-based device is illustrated in Figure 1 of Applicants' Specification, and elsewhere in the description.

As to claim 18, the applicants have amended "that is a non-transitory storage medium" to the existing claim language in response to the pending Office action. (See Office action, page 5). Support is found in Applicants' Specification at page 5 lines 13-20.

For these reasons, the applicants respectfully submit that the amended claims are compliant with 35 U.S.C. § 101 and have therefore overcome this rejection.

Overview of Distinguishing Characteristics of the Present Invention

To help understand Applicants' arguments below and to put the amended claims into clearer context, the Applicants distinguish a number of characteristics of the present invention.

First, the Applicants note that the following reference, authored by the inventors, is incorporated by reference in the present application at page 13, line 22: Li et al., "An Information Theoretic Approach for Using Word Cluster Information in Natural Language Call Routing," Proceedings of EuroSpeech '03, pp. 2829-32, Sep. 2003 (hereinafter "Li-2003"). Substantial references to this document are made in the remarks below.

Second, the present invention relies on at least two sources of terms upon which to execute the classification functions of the joint classifier. The two sources of terms are (i)

"terms obtained from word terms" and (ii) "terms obtained from the word classes." (Li-2003, § 3.2, para. 3). This key aspect of the present invention is often stressed in Li-2003 and in Applicants' Specification. For example, Li-2003 states:

In this paper, we study and provide solutions to the following two critical issues . . . how to **combine both** word classes and word terms information to enhance the robustness and performance in a natural language understanding task . . . (§ 1, para. 3)

We show . . . a new joint classifier based on **both** word term and word class information. (§ 3.1, para. 3)

The joint **word and word class** LSI classifier in our approach is based on **the union of terms** obtained from word terms as in the standard LSI, and the terms obtained from the word classes. (§ 3.2, para. 3)

In our proposed approach, terms are selected and used . . . given the **joint information of both word terms and word classes**. . . . sort all (word, word class) terms . . . (§ 3.2, para. 5)

[T]here types of LSI classifiers were constructed: . . . LSI classifier trained and tested on the **joined corpus**. (§ 4.2, para. 2)

The information theoretic approach based on information gain (IG) was used to **combine both word term and word class Information** in NLCR. (§ 5, para. 1)

(Li-2003, (emphasis added)).

Based on any careful reading of Li-2003, coupled with like disclosures in the Applicants' Specification, there can be little doubt that the operations disclosed in the present application are based on two (or more) sources of terms, specifically on a source of word terms and on a source of word classes. For example, the Summary of the Invention recites that "words and word classes utilized to provide the respective word information and word class information for use in the joint classifier may be selected using information gain based term selection." (Applicants' Specification, page 2, lines 25-27). "The combination of word information and word class information" further stresses this concept. (Applicants' Specification, page 3, line 5). Other references to the combined (or joint or joined nature of the) sources of terms for the present invention are recited in several other portions of Li-2003 and Applicants' Specification.

This distinctive "combination" feature, represented by the union of terms from at least two sources, is both novel and nonobvious, as discussed in more detail in the remarks below.

Third, the present invention relies on information-gain (IG) calculations to select only certain terms from the union of terms before it executes the classification functions of the joint classifier. The IG-based selection is useful because "not every word term has detailed information that is salient for natural language understanding, and not every word class is robust and useful either." (Li-2003, § 3.1, para. 1). "The IG based term selection provides a unified approach to select salient features from multiple information sources." (Li-2003, § 3.1, para. 3; see also Applicants' Specification, page 3, line 11).

This distinctive selection method based on IG values is novel and nonobvious as discussed in more detail below.

The applicants respectfully submit that the amended claim language properly reflects these patentably distinguishable characteristics of the present invention.

35 U.S.C. § 102 Rejection of Claims 1 and 15-18

Claims 1 and 15-18 were rejected under 35 U.S.C. § 102(b) as being anticipated by Segond et al., U.S. Patent No. 6,405,162 B1 (hereinafter "Segond"). The applicants respectfully submit that the amended claims overcome this rejection.

Claim 1 as amended recites:

1. A method comprising:
receiving, by a processor-based device, a communication that comprises a word that is a natural-language word;
generating by the processor-based device a union of terms comprising:
(i) a first set of word-terms, and
(ii) a set of word-classes;
selecting by the processor-based device a plurality of terms from the union of terms, wherein the selecting is based on an information-gain value of each term in the union of terms; and
performing, by the processor-based device, **latent semantic indexing upon the plurality of terms** to determine a category of the word.
(emphasis added)

Nowhere does Segond, taken alone or in combination with the other references, teach, suggest, or motivate the salient limitations recited in claim 1 – namely (i) generating a union of terms that comprises both word terms and word classes, and (ii) selecting some terms from the union of terms based on their respective information-gain value, and (iii) applying latent semantic indexing only to the selected terms. Accordingly, there is at least one limitation in claim 1 that Segond does not recite.

First, Segond applies a qualitative, not a quantitative, priority scheme. Segond relies on a Segond-specific type of information that it associates with each term, the type being defined as “a category applicable to information . . . about a sense [distinct meaning] of a word in a dictionary . . . such as collocates, idioms, compounds, structure examples, [etc.]” (Segond, col. 6, lines 15-22; see also col. 3, lines 20-22 & 30-37). Based on the distinct types of information, Segond applies a prioritization scheme “from highest to lowest” in accordance with Segond’s definition of what is a high priority type and a lower priority type. (See Segond, col. 3, lines 33-34). These priority settings are qualitative.

By contrast, the method of claim 1 relies on a quantitative value calculated from information-gain formulas disclosed in the Applicants’ Specification at pages 9-10. There is simply no relationship or analogue between Segond’s qualitative prioritization scheme and the quantitative IG-based selection method of claim 1.

Second, a careful reading of the Segond passages cited in the Office action reveals that Segond's disambiguation is based on the above-described type at such times as more than one type of information is available for a given word. (See Segond, col. 6, lines 28-41). However, nowhere does this disclosure teach, suggest, or motivate either (i) the use of information-gain values for term selection, or (ii) a union of both word terms and word classes upon which the selection is applied, as claim 1 recites.

Third, as regards the source of terms, Segond appears to expressly limit itself to analyzing one source of terms at a time – in contrast to the combined union of terms in claim 1. For example, Segond's Figure 7 shows that only when no word-based rules are found in step 302, does Segond proceed to class-based rules, if any, in step 320. Thus, Segond appears to prefer word-based rules over class-based rules – and does not analyze a union of terms of both word terms and word classes, as claim 1 recites. This conclusion is supported by Segond's discussion of the corpus at col. 2, lines 48-67, a discussion that in no way alludes to creating a joined (or joint or combined) corpus from more than one source of terms. Moreover, and conclusively, the preference for word-based rules is clearly articulated in Segond at col. 11, lines 55-64.

By contrast, there is no such preference in the method of claim 1, because this method operates on the union of both word terms and word classes, as explained above. Accordingly, the method of claim 1 selects terms based on their respective information-gain value – without regard to whether the selected term is a word-term or a word-class.

For these reasons, the applicants respectfully submit that Segond does not anticipate claim 1 and therefore claim 1 is allowable.

Claim 15 as amended recites:

15. An apparatus comprising:
a processor-based device operative to:
receive a communication that comprises a word that is a natural-language word; and
classify the communication by utilizing a joint classifier that is operative to:
generate a union of terms comprising:
(i) a set of word-terms, and
(ii) a set of word-classes;
select a plurality of terms from the union of terms, based on an information-gain value of each term in the union of terms; and
perform latent semantic indexing upon the plurality of terms to determine a category of the word.

(emphasis added)

Claim 15 recites in part some of the salient limitations recited above for claim 1. Therefore, for the same reasons given in support of claim 1, the applicants respectfully submit that claim 15 is allowable over Segond.

Because they depend on claim 15, claims 16-17 are likewise allowable. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

Claim 18 as amended recites:

18. An article of manufacture comprising:

a machine-readable storage medium that is a non-transitory storage medium and that comprises software code that when executed implements the steps of:

receiving a communication that comprises a word that is a natural-language word;

generating a union of terms comprising:

- (i) a set of word-terms, and
- (ii) a set of word-classes;

selecting a plurality of terms from the union of terms, wherein the selecting is based on an information-gain value of each term in the union of terms;

performing latent semantic indexing upon the plurality of terms to determine a category of the word, wherein the category of the word is a cell in a term-category matrix that results from the latent semantic indexing; and

routing the communication to a destination terminal in a communication system that comprises the machine-readable storage medium and the destination terminal.

(emphasis added)

Claim 18 recites in part some of the salient limitations recited above for claim 1. Furthermore, Segond does not teach, suggest, or motivate routing a communication to a destination terminal in a communication system – as claim 18 recites.

For this reason and for the same reasons given in support of claim 1 and claim 15, the applicants respectfully submit that claim 18 is allowable over Segond.

35 U.S.C. § 103 Rejection of Claims 3-14

Claims 3-14 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Segond in various combinations with each of five other references. The applicants respectfully submit that the amended claims overcome each ground for rejection, as explained in more detail below.

Claim 3, which depends from claim 1, was rejected as being unpatentable over Segond in light of Lee et al., U.S. Patent No. 6,925,432 B2 (hereinafter “Lee”).

As noted above, Segond does not anticipate claim 1. Moreover, Lee, taken alone or in combination with Segond, does not teach, suggest, or motivate the salient limitations recited for claim 1.

First, Lee discloses nothing about using as a basis for analysis a union of terms that comprises both word terms and word classes – in contrast to claim 1.

Second, Lee discloses nothing about using information-gain values as a basis for selecting terms – in contrast to claim 1.

In contrast to the method of claim 1, Lee appears to rely on a Generalized Probabilistic Descent (GPD) algorithm directed at word classes but not at word terms. (See Lee, Abstract; see also Figure 7; col. 5, lines 7-10). Moreover, GPD is patentably distinguishable from information-gain value calculation and selection, as claim 1 recites.

Thus, Lee does not cure the deficiencies of Segond in regards to claim 1. Therefore, there is no combination of Segond and Lee that teaches, suggests, or motivates the method of claim 1. Because it depends from claim 1, claim 3 is allowable over the cited references. Moreover, the recitation of additional patentable features in this claim forms an added basis for its patentability.

Claim 4, which depends from claim 1, was rejected as being unpatentable over Segond in view of Sakai et al., U.S. Patent No. 7,099,819 B2 (hereinafter "Sakai").

As noted above, Segond does not anticipate claim 1. Moreover, Sakai, taken alone or in combination with Segond, does not teach, suggest, or motivate the salient limitations recited for claim 1.

For example, Sakai discloses nothing about the use of information-gain values for term selection – in contrast to claim 1. Nor does Sakai's method of word clustering (to create word classes) suggest, teach, or motivate a union of terms that comprises both word classes and individual word terms – in contrast to claim 1. Sakai's category analysis cited in the Office action does not pertain to the salient limitations of claim 1 recited above.

Thus, Sakai does not cure the deficiencies of Segond in regards to claim 1. Therefore, there is no combination of Segond and Sakai that teaches, suggests, or motivates the method of claim 1. Because it depends from claim 1, claim 4 is allowable

over the cited references. Moreover, the recitation of additional patentable features in this claim forms an added basis for its patentability.

Claims 5-6, which depend from claim 1, were rejected as being unpatentable over Segond in view of Li et al., "Improving Latent Semantic Indexing Based Classifier with Information Gain," 7th International Conference on Spoken Language Processing, Sep. 2002 (hereinafter "Li-2002"). The applicants note that the authors of Li-2002 are two of the co-inventors of the present invention.

As noted above, Segond does not anticipate claim 1.

Although Li-2002 discloses the use of information-gain values, nowhere does Li-2002 teach, suggest or motivate the use of a combined union of terms that comprises both word terms and word classes as the basis upon which term selection is to be applied. As explained in the present application and in Li-2003, the union of terms from multiple sources, and particularly the combination of word terms and word classes, provides to the present invention an added robustness and performance improvement over the prior art.

Thus, Li-2002 does not cure the deficiencies of Segond in regards to claim 1. Therefore, there is no combination of Segond and Li-2002 that teaches, suggests, or motivates the method of claim 1. Because they depend from claim 1, claims 5-6 are allowable over the cited references. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

Claims 10-14 were rejected as being unpatentable over Segond in view of Li-2002.

Claim 10 as amended recites:

10. A method comprising:

receiving, by a processor-based device, a communication that comprises a word that is a natural-language word;

generating by the processor-based device a union of terms comprising:

- (i) a set of word-terms, and
- (ii) a set of word-classes;

selecting by the processor-based device a plurality of terms from the union of terms, wherein the selecting is based on applying a percentile value to an information-gain value of each term in the union of terms; and

classifying the communication by **utilizing a joint classifier upon the plurality of terms**, wherein the joint classifier comprises at least one term-category matrix that results from the selecting based on information-gain values and from applying latent semantic indexing to the plurality of terms.

(emphasis added)

Nowhere do Segond and Li-2002, taken alone or in combination, teach, suggest, or motivate the salient limitation recited in claim 1 – namely generating a union of terms that comprises both word terms and word classes and which forms the basis for the classification operations upon a selection of terms from the union of terms.

For the same reasons given above in support of claims 5-6 in regards to Segond and Li-2002, the applicants respectfully submit that claim 10 is allowable over these references. Because it depends from claim 10, claim 11 is likewise allowable. Moreover, the recitation of additional patentable features in this claim forms an added basis for its patentability.

Claim 12 as amended recites:

12. (Currently Amended) A method comprising:

receiving, by a processor-based device, a communication that comprises a word that is a natural-language word;

generating by the processor-based device a union of terms comprising:

(i) a set of word-terms, and
(ii) a set of word-classes; and

selecting by the processor-based device a plurality of terms from the union of terms, wherein the selecting is based on an information-gain value of each term in the union of terms, and wherein the selecting comprises:

i) calculating an information-gain value for each term in the union of terms that corresponds to the word,
ii) sorting the terms in the union of terms in a descending order of information-gain value,
iii) setting a threshold of an information-gain value corresponding to a specified percentile, and
iv) selecting the terms from the union of terms having an information-gain value greater than or equal to the threshold to generate a plurality of terms.

(emphasis added)

Claim 12 recites in part some of the salient limitations recited above for claim 10.

For the same reasons given in support of claim 10, the applicants respectfully submit that claim 12 is allowable over Segond and Li-2002. Because they depend from claim 12, claims 13-14 are likewise allowable. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

Claim 7, which depends from claim 1, was rejected as being unpatentable over Segond in view of R. F. Mihalcea, "Bootstrapping Large Sense Tagged Corpora," Proceedings of the 3rd International Conference on languages Resources and Evaluations (LREC 2002), May 2002 (hereinafter "Mihalcea").

As noted above, Segond does not anticipate claim 1. Moreover, Mihalcea, taken alone or in combination with Segond, does not teach, suggest, or motivate the salient limitations recited for claim 1.

Mihalcea does not cure the deficiencies of Segond in regards to claim 1. Mihalcea is generally concerned with generating more robust corpora for word sense disambiguation. (See Mihalcea, § 1).

In contrast to the method of claim 1, however, Mihalcea does not disclose, suggest, or motivate the salient limitations of claim 1 – namely (i) generating a union of terms that comprises both word terms and word classes, and (ii) selecting some terms from the union of terms based on their respective information-gain values.

First, nowhere does Mihalcea teach, suggest, or motivate the use of information-gain values for term selection.

Second, Mihalcea does not disclose the word classes in Applicants' Specification, because Mihalcea generates tags for certain words and iteratively builds a corpus. Mihalcea is generally concerned with tagging, not with generating a union of word terms and word classes as claim 1 recites. Merely disclosing a corpus-building technique, by itself, is not enough to disclose the particular species of word classes in Applicants' Specification.

Thus, Mihalcea does not cure the deficiencies of Segond in regards to claim 1, and therefore, there is no combination of Segond and Mihalcea that teaches, suggests, or motivates what claim 1 recites. Therefore, the applicants respectfully submit that claim 7, which depends from claim 1, is allowable over the cited references. Moreover, the recitation of additional patentable features in this claim forms an added basis for its patentability.

Claims 8-9, which depend on claim 1, were rejected as being unpatentable over Segond in view of Ringger et al., U.S. Patent No. 6,606,597 (hereinafter "Ringger").

As noted above, Segond does not anticipate claim 1.

Like the other references, Ringger does not cure the deficiencies of Segond in regards to claim 1, because it fails to disclose information-gain as the basis for term selection.

Therefore, there is no combination of Segond and Ringger that teaches, suggests, or motivates what claim 1 recites. Therefore, the applicants respectfully submit that claims 8-9, which depend from claim 1, are allowable over the cited references. Moreover, the recitation of additional patentable features in these claims forms an added basis for their patentability.

Request for Reconsideration Pursuant to 37 C.F.R. 1.111

Having responded to each and every ground for objection and rejection in the last Office action, applicants respectfully request reconsideration of the instant application pursuant to 37 C.F.R. 1.111 and request that the Examiner allow all of the pending claims and pass the application to issue.

If there are remaining issues, the applicants respectfully request that Examiner telephone the applicants' attorney so that those issues can be resolved as quickly as possible.

Respectfully,
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